

Favorable Post-Resective Outcomes in MRI-Negative Refractory Extratemporal Localization-Related Epilepsy Using Subtraction Ictal SPECT Co-registered to MRI (SISCOM)

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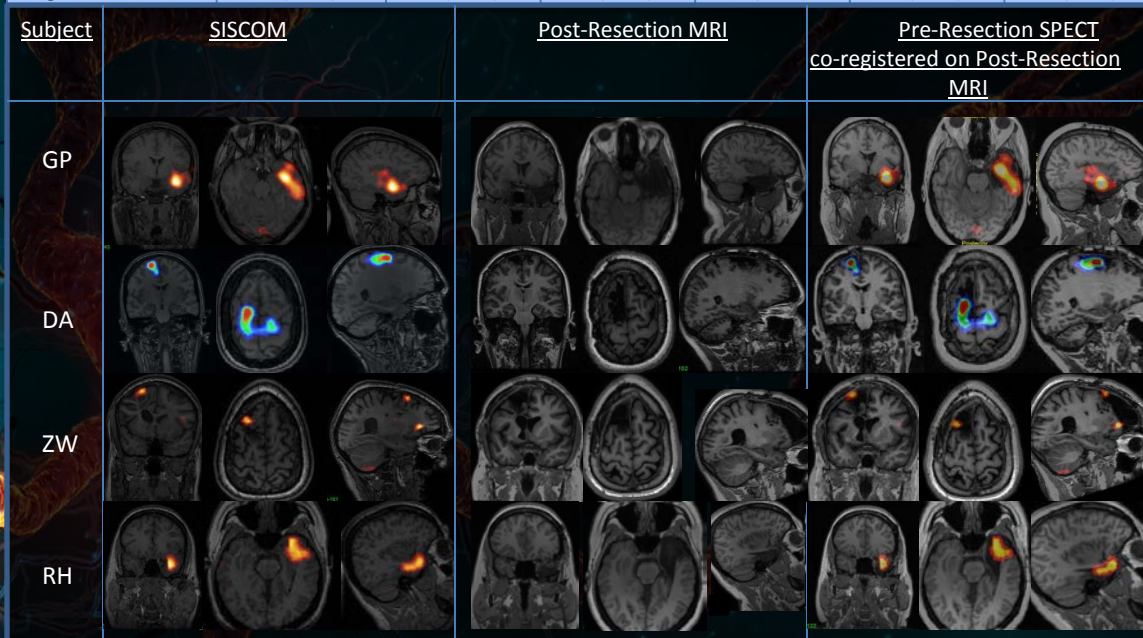
1. RATIONALE

Between 20-50% of patients with refractory localization-related epilepsy are MRI-negative and demonstrate less favorable outcomes. We investigated the Rush Epilepsy Center experience (2002-2012) of post-resective outcomes using subtraction ictal SPECT co-registered to MRI (SISCOM) on a Siemens two-detector gamma camera, compared with intracranial EEG (ICEEG), to localize the ictal onset zone (IOZ). The purpose of our study was to assess whether SISCOM can improve detection and definition of the IOZ in MRI-negative extratemporal lobe epilepsy (ETLE) and impact long-term post-surgical outcomes.

2. METHODS

The study cohort included 39 consecutive patients with temporal lobe epilepsy (TLE) and ETLE who underwent presurgical evaluation including SISCOM. SISCOM localization was determined by a blinded board certified epilepsy neurologist (MAR). Concordance was determined between SISCOM localization and ICEEG on the basis of an overlapping ictal onset zone. Post-surgical follow-up was greater than 24 months in 37/39 patients.

| SISCOM Concordant with eCOG and overlapping with the resection site (n= 32) | | | | | | |
|---|--|--|------------------------------|---|---|------------------------|
| Resection of SISCOM focus | ETLE MRI-lesional concordant with eCOG (n=6) | ETLE MRI lesional non-concordant with Ecog (n=2) | ETLE MRI Non-lesional (n=11) | TLE MRI-lesional concordant with eCOG (n=8) | TLE MRI lesional non-concordant with Ecog (n=3) | MRI Non-lesional (n=2) |
| Engels class 1 | 3 (50%) | 1 (50%) | 7 (64%) | 7 (88%) | 1 (33%) | 1 (50%) |
| Engels class 2 | 0 | 0 | 0 | 0 | 1 (33%) | 0 |
| Engels class 3, 4 | 3 (50%) | 1 (50%) | 4 (36%) | 1 (12%) | 1 (33%) | 1 (50%) |



| Resection of SISCOM focus (n= 34/39 patients) | Complete (n=7) | Partial (n=16) | Not Excised (SISCOM non-localizing) (n=11) |
|---|----------------|----------------|--|
| Engels class 1 | 5 (72%) | 10 (63%) | 4 (36%) |
| Engels class 2 | 0 | 0 | 1 (9%) |
| Engels class 3 | 1 (14%) | 1 (6%) | 2 (18%) |
| Engels class 4 | 1 (14%) | 5 (31%) | 4 (36%) |

3. RESULTS

Of 39 patients, 24(62%) became seizure-free (Engel's class I) after 24 months. Concordance of ICEEG and SISCOM was found in 29/39 (74%) patients, 16/29 (55%) became seizure-free. SISCOM alone was localizing with resection site in 31/39 patients (80%). Of these 31 patients, 14 were TLE (1 patient was MRI-negative) and 17 were ETLE.

4. CONCLUSION

These data from our center confirm previous studies demonstrating the utility of SISCOM improving the outcomes of MRI-negative ETLE. Of interest, a marked number of MRI-lesion positive patients with non-localizing SISCOM (inj time < 30 sec) have favorable post-resective outcomes. Concordance results of SISCOM and ICEEG provide useful additive information for predicting post-resective outcome. In addition, SPECT scanner technology limitations may contribute to the sensitivity of SISCOM.

Of the 13 MRI-lesion positive and SISCOM localizing TLE patients, 8(62%) achieved Engel's class I; 1(8%) class II; 2(15%) class III and 2(15%) class IV. The one MRI-lesion negative TLE achieved Engel's class III. 8/17 (47%) ETLE patients were MRI-lesion positive and SISCOM localizing, 3(38%) achieved Engel's class I; 5(62%) class IV. In contrast, among the 9/17(53%) MRI-lesion negative ETLE patients, 5(56%) achieved class I; 1(11%) class III and 3 (33%) class IV. SISCOM was not localizing in 8/39 (21%) patients (MRI-lesion positive=7; ETLE MRI-lesion positive=4; ETLE MRI-lesion negative=1), 6(74%) achieved class I; 1(13%) class II; 1(13%) class III. Time to injection of Ceretec radiotracer for ictal SPECT for patients achieving class I was on average 28 sec, class II: 12 sec, class III: 10 sec, and class IV: 28 sec.